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*Alfalfa*

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U. S. DEPARTMENT OF AGRICULTURE

*Varieties*  
in the United States



Farmers' Bulletin No. 1731  
U. S. DEPARTMENT OF AGRICULTURE

**T**HE commercial alfalfas of the United States may be divided into four somewhat distinct groups, each containing strains or varieties that vary considerably within themselves: (1) The common alfalfa group, (2) the Turkistan group, (3) the variegated group, and (4) the nonhardy group. These varieties or strains have been tested for some years, and it is now possible to designate the localities where each can be most profitably grown or the specific conditions under which each will give the most satisfactory results.

The purchaser of seed is aided materially in obtaining the kind desired by the registration and certification service in many States; the United States Verification Service; and the staining requirements of imported seed.

This bulletin is a revision of and supersedes Farmers' Bulletin 1467, Commercial Varieties of Alfalfa. •

# ALFALFA VARIETIES IN THE UNITED STATES<sup>1</sup>

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## Contents

	Page		Page
Varieties and strains of alfalfa-----	1	Variegated group—Continued.	
The common alfalfa group-----	2	Baltic-----	10
Domestic strains-----	3	Hardigan-----	10
Argentine alfalfa-----	3	Sand lucern-----	11
South African alfalfa-----	4	Nonhardy group-----	11
Provence alfalfa-----	5	Peruvian-----	11
Turkistan group-----	5	Arabian-----	12
Turkistan-----	5	Yellow-flowered group-----	12
Hardistan-----	6	New varieties-----	13
Orestan-----	7	Ranger-----	13
Variegated group-----	7	Buffalo-----	14
Grimm-----	7	Atlantic-----	15
Cossack-----	8	Nemastan-----	15
Canadian Variegated-----	9	Varieties for various sections-----	15
Ladak-----	9	Safeguards in purchasing seed-----	16

## VARIETIES AND STRAINS OF ALFALFA

PRIOR to 1892 there was no commercial recognition of alfalfa varieties in the United States, whether of foreign or domestic origin. As attempts to grow the crop spread to areas where conditions were less favorable, however, differences in behavior became apparent. This finally resulted in the recognition and adoption of several fairly distinct commercial varieties and strains that show great diversity in their relations to climate and latitude. Some give best results in the North, where the winters are cold and the days are long during the growing season; others do better in the extreme South, where the winters are mild and the days during the summer are shorter than in the Northern States.

The commercial alfalfas of the United States may be divided into four somewhat distinct groups, each containing strains<sup>3</sup> or varieties that vary considerably within themselves. These groups may be briefly described as follows.

The common group includes the ordinary purple-flowered, smooth alfalfa, of which numerous regional strains have developed naturally in the western part of the United States and in foreign countries.

<sup>1</sup> This bulletin is devoted mainly to a discussion of the varieties and strains of alfalfa that are of commercial importance in the United States. A few varieties that are not grown commercially but are of interest because of resistance to cold or disease or because of peculiar adaptation are also included. No attempt has been made to discuss many other alfalfas that have been grown experimentally from time to time.

<sup>2</sup> Died Jan. 2, 1943; bulletin revised May 1945 by H. M. Tysdal, senior agronomist, Division of Forage Crops and Diseases.

<sup>3</sup> In this bulletin the word "strain" is applied to alfalfas that are only slightly different from those that are typical of the ordinary purple-flowered alfalfa and also occasionally to alfalfas that belong to other groups where they are considered with reference to these groups. The alfalfas of the common group that have developed in various regions are called "regional strains," since they do not possess sufficiently distinct characteristics to be considered varieties.

The Turkistan group includes alfalfas that are similar in flower color to the common alfalfas, but the growth is generally somewhat shorter and more spreading. No commercial distinction is made between the various strains as imported from Turkistan, but the names Hardistan and Orestan are given to two strains, the seed of which is being increased in this country.

The variegated group includes alfalfas that have originated from crosses between common alfalfa (*Medicago sativa*) and the yellow-flowered species (*M. falcata*). Grimm, Canadian Variegated, Cossack, Baltic, Ladak, and Hardigan are the best known examples.

The nonhardy group includes rather distinct varieties that are in general very erect in habit of growth, recover quickly after cutting,



FIGURE 1.—Alfalfa selections resistant to the bacterial wilt disease (both sides) compared with an unselected susceptible Grimm (center), growing in a nursery at Madison, Wis.

have a long growing period, and are very susceptible to low temperatures. The Peruvian and Arabian varieties are members of this group.

With the increasing seriousness of the bacterial wilt disease caused by *Corynebacterium insidiosum* it became necessary to develop varieties resistant to this disease to maintain alfalfa production (fig. 1). A few new resistant varieties have been developed and these are described on pages 13 to 15.

### THE COMMON ALFALFA GROUP

Comparatively little is known about the origin of common alfalfa, though there is reason to believe that it developed in western Asia and was one of the first plants to be cultivated solely for forage. The stock

from which most of the common alfalfa of our Western States has been produced was brought from Spain to Chile and, after having been grown there for many years, was introduced into California about 1850. In most lots of common alfalfa some plants grow more quickly than others after being cut and have a tendency to produce larger yields. These plants are favored by a mild climate and for convenience are referred to as the southern, or nonhardy, type. The plants that recover more slowly after being cut and become dormant earlier in fall are more cold-resistant and are referred to as the northern, or hardy, type. These various types furnish a basis for regional strains which, as at present defined, are produced when common alfalfa is grown for several seed generations in definite localities where eliminating conditions of one kind or another normally prevail. None of the common alfalfas tested thus far has shown any appreciable resistance to bacterial wilt.

#### DOMESTIC STRAINS

The various strains of common alfalfa produced in the United States are usually distinguished by the name of the State, as Kansas or Montana Common, or else by some term descriptive of the condition under which the seed is produced, such as dry-land, irrigated, and nonirrigated alfalfa. The environment under which alfalfa is grown undoubtedly has an important influence on its characteristics, but just how many seed generations are required to bring about a distinct change doubtless varies with the eliminating climatic conditions and cannot be estimated accurately.

The so-called regional strains that have developed in the Dakotas and Montana have a tendency to recover more slowly after being cut than those produced farther south and, being more cold-resistant, are preferable where winterkilling occurs rather frequently. Such strains are generally less productive at the lower latitudes than the more southern strains. The strains produced in the Southwest, often called Chilean alfalfa, recover rapidly after being cut but are very susceptible to cold and are likely to suffer serious winter injury except in the most southern States. Common alfalfas produced in Kansas and Oklahoma are intermediate between the northern and southern types as regards cold resistance and rapidity of recovery after being cut. These strains are recommended for sections having a latitude similar to that in which the seed was produced and where winterkilling normally is not a serious factor.

The common alfalfas produced in the intermountain region vary somewhat in winter hardiness. In general they have given fairly satisfactory results where Kansas Common succeeds, though seemingly in general slightly less cold-resistant. Tests of dry-land or nonirrigated alfalfa conducted by the United States Department of Agriculture have not thus far shown any material advantage over seed produced under irrigation.

#### ARGENTINE ALFALFA

During the five prewar fiscal years 1936 to 1940 the average annual importation of seed from Argentina amounted to about 650,000 pounds.

At present there is much interest in the suitability of Argentine seed for various parts of the United States. Practically all the Argentine alfalfa belongs to the common group, though several more or less distinct strains have developed as a result of having been grown under widely varying conditions of climate and latitude. Most of the seed brought to the United States is produced south of Buenos Aires, where climatic conditions are much less severe than those at a similar latitude in this country and therefore are not conducive to the development of a hardy strain. The tests thus far conducted in the United States indicate that some Argentine strains are less hardy and that the hardiest are no hardier than our own Kansas Common. For this reason, Argentine alfalfa cannot be sown with safety any farther north than Kansas alfalfa is known to succeed (fig. 2). Experimental results in the central or southern parts of the United States indicate

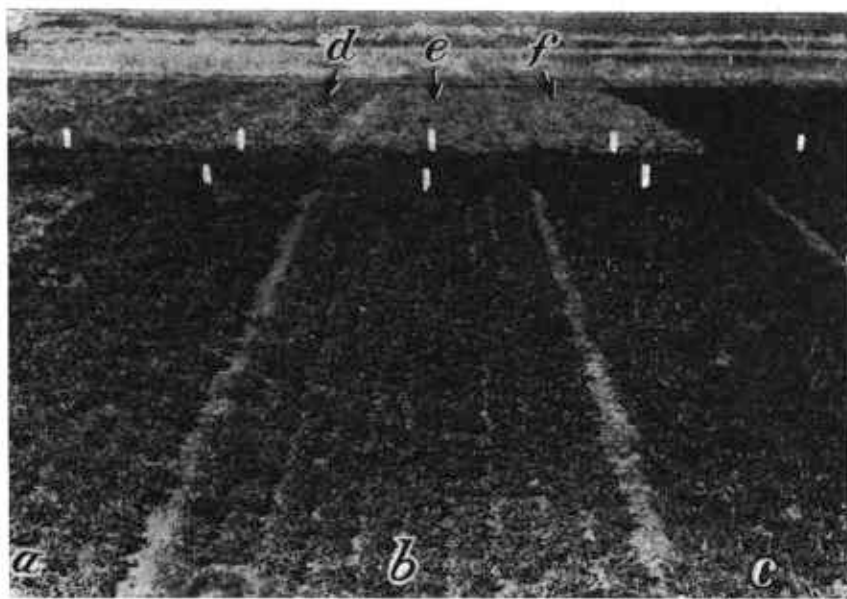


FIGURE 2.—Effect of cold on alfalfa varieties at the Nebraska Agricultural Experiment Station: *a*, Grimm; *b*, Ranger; *c*, Meeker Baltic; *d*, Argentine F. C. No. 22585; *e*, Chilean; *f*, Argentine F. C. No. 22564. Plots *a*, *b*, and *c* show excellent stands after the second winter.

that in most areas Argentine alfalfa may be expected to yield 5 to 20 percent less than locally adapted varieties.

Under the Federal Seed Act of August 9, 1939, 10 percent of the seed of Argentine alfalfa must be stained orange-red before it is permitted entry, to indicate that it is of agricultural value only in limited areas.

#### SOUTH AFRICAN ALFALFA

During the six fiscal years 1920 to 1925 enough alfalfa seed was imported from South Africa to stimulate interest in its suitability for the

United States. Most lots of South African seed that have been tested have proved to be somewhat less cold-resistant than Kansas Common. Even where the South African alfalfa survives the winter satisfactorily it has shown no advantage over the adapted domestic strains.

Under the Federal Seed Act amendment, 10 percent of the South African alfalfa seed must be stained red before it is permitted entry, to indicate that it is not adapted to general agricultural use in the United States.

#### PROVENCE ALFALFA

Provence is the name applied to a strain of alfalfa grown in southeastern France. It differs so slightly from the common regional strain produced in Kansas that one can scarcely be distinguished from the other. There are, however, a few differences of some importance. Provence begins growth earlier in spring and continues to grow later in fall in the southern part of the United States than the strain from Kansas. It also makes somewhat quicker growth after being cut. It is not quite so hardy, however, and cannot be recommended generally north of the central part of the United States.

Under the Federal Seed Act amendment, 10 percent of the alfalfa seed produced in France must be stained red before it is permitted entry.

#### TURKISTAN GROUP

Alfalfas either directly or indirectly of Turkistan origin include Turkistan, Hardistan, and Orestan. They are characterized by slow recovery after being cut, early fall dormancy, susceptibility to leaf diseases, resistance to cold and bacterial wilt, and low seed yields.

#### TURKISTAN

Turkistan alfalfa was first introduced into the United States in 1898 through the efforts of the United States Department of Agriculture. The superior cold resistance of the early importations resulted in a demand for Turkistan seed for sowing in the cold, dry regions of the northern Great Plains. During the years 1908 to 1915 and 1920 to 1928, considerable seed was received through commercial channels, but since 1928 very little has been imported from Turkistan. Unfortunately, much of that imported was sown in the East, where it gave very unsatisfactory results, and various means were employed to warn growers against its use, particularly in the East and South. Recently, however, interest in Turkistan alfalfa has revived, mainly as a result of its resistance to bacterial wilt, a disease responsible for serious losses, especially in some of the best alfalfa-growing districts of the Middle West and far West.

As compared with the commercial strains of common alfalfa grown in this country, Turkistan alfalfas are usually characterized by purple flowers, lower and somewhat more spreading growth, smaller and slightly more hairy leaves, and fine stems; but it is almost impossible even for a botanist to distinguish between individual plants of Turki-



stan alfalfa and those of the common American strains. In comparative tests Turkistan alfalfa has produced relatively low yields of seed.

Comprehensive tests have shown considerable variation in the cold and wilt resistance of Turkistan alfalfas, but fortunately seed from the main producing districts in Turkistan has shown a rather high degree of resistance to both. In the absence of bacterial wilt some of our domestic alfalfas have been consistently more productive than Turkistan alfalfa. Even where wilt occurs, many alfalfas, though susceptible to the disease, usually give better yields for 2 or 3 years, but where stands are to remain longer Turkistan alfalfa will yield more in the later years. In parts of Utah and possibly elsewhere Turkistan has seemed to be more susceptible to bacterial stem blight than other alfalfas.

Experiments indicate that where bacterial wilt is destructive Turkistan alfalfa can be used to advantage in States west of the Mississippi River and from Kansas northward. New varieties, however, combine the bacterial wilt resistance of Turkistan with superior performance and might replace Turkistan alfalfa in this area. In certain parts of Utah the value of Turkistan alfalfa where wilt occurs is apparently limited by its susceptibility to bacterial stem blight. It has not given good results in the East, partly because of its susceptibility to leaf diseases and partly because of its tendency to become dormant early in fall, thus permitting weeds to invade the field and gradually crowd out the alfalfa. Both of these characteristics contribute to the short survival of Turkistan fields under humid conditions. Because of its low productivity in the Southern States, Turkistan has not shown any promise, even where bacterial wilt is prevalent.

Alfalfa seed produced in Turkistan can usually be identified by the presence of seed of Russian knapweed (*Centaurea picris*), which it almost invariably contains. This seed is considerably larger than alfalfa seed, of an oblong shape, and of an ivory-whitish color. Russian knapweed has become established in certain parts of the West, where it is regarded as a dangerous pest.

Under the Federal Seed Act amendment, 10 percent of the Turkistan alfalfa seed must be stained red before it is permitted entry, to indicate that it is of agricultural value only in limited areas where bacterial wilt is prevalent.

#### HARDISTAN

Hardistan is the name given by the Nebraska Agricultural Experiment Station to a promising strain of Turkistan alfalfa grown in Nebraska several years, seed of which was originally obtained through commercial channels. In comparative tests it has reacted very similarly to some of the commercial Turkistan strains as to cold and wilt resistance, susceptibility to leaf diseases, early fall dormancy, and productivity of seed and forage. Where wilt is prevalent certain domestic alfalfas are generally more productive for 2 or 3 years, but where the stands are to be maintained several years the average

annual yields of Hardistan are likely to be greater, owing to the gradual thinning out of the susceptible alfalfas by the disease. Hardistan can be used to advantage under the same conditions as Turkistan, and, like Turkistan, it produces relatively low yields of seed under most conditions. The supply of commercial seed has been rather limited.

#### ORESTAN

Orestan is a name given by the Oregon Agricultural Experiment Station to an alfalfa that was originally introduced by H. L. Westover from Turkistan, Asia, under Forage Crops No. 19301. It is similar in all respects to some of the better lots of commercial Turkistan alfalfa and is adapted for growing in the same parts of the United States. In common with the Turkistan group, it is not a good seeder and its increase has been slow if not discouraging. Very little seed is commercially available.

#### VARIEGATED GROUP

The variegated alfalfas have resulted from a natural cross between the purple-flowered and the yellow-flowered species. The predominant color of the flowers is similar to ordinary alfalfa, but brown, green, greenish-yellow, and smoky flowers are not uncommon, and pure yellow flowers are found occasionally. It is because of this range in flower color that the designation "variegated" is applied to the group. The various members of the group are often so similar that it is impossible to distinguish between them, but there is usually little difficulty in distinguishing between the common and the variegated alfalfas by the color of the flowers and shape of the pods. As a rule, the alfalfas of this group are more resistant to cold than common alfalfas, probably because of the presence of yellow-flowered alfalfa in their ancestry. With the exception of Ladak, none of them has shown any appreciable resistance to bacterial wilt. Ladak is somewhat tolerant to the disease.

#### GRIMM

Grimm alfalfa is the most important member of the variegated group in the United States. It was introduced from Germany into Carver County, Minn., in 1857 by Wendelin Grimm and eventually attracted considerable attention on account of its cold resistance.

To the casual observer Grimm alfalfa differs little from the common strains, but a closer examination will reveal a greater diversity of forms. Although the flowers are mainly similar to common alfalfa in color, the presence of variegated flowers characteristic of the group indicates definitely that Grimm is the result of a cross between the common and the yellow-flowered species. Variegated flowers are usually more in evidence in semiarid than in humid districts.

The hardiness of Grimm is probably due in part to the presence of yellow-flowered alfalfa in its ancestry and in part to the process of natural selection that took place under the severe climatic conditions

to which it was subjected for many years in Minnesota. On account of its superior hardiness the variety is particularly recommended for all the Northern States where winterkilling is a serious factor (fig. 3). In the southern half of the United States it is less productive than some of the less hardy and more rapidly growing alfalfas. It is very susceptible to the bacterial wilt disease and is therefore becoming less popular in many areas.

In ability to produce seed Grimm is at least the equal of common alfalfa.

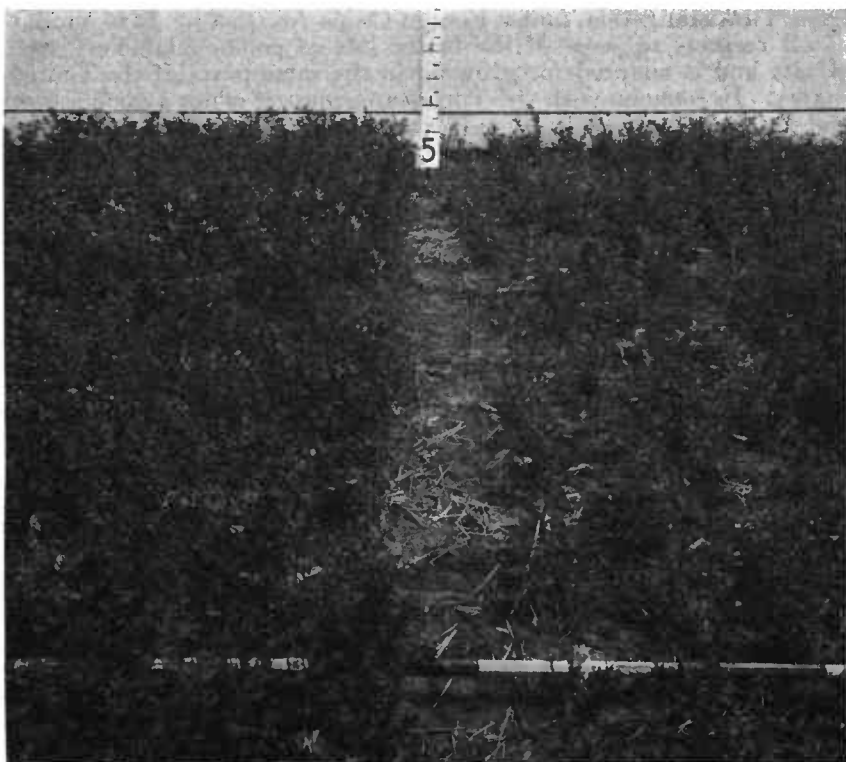


FIGURE 3.—Winterkilling in Utah Common alfalfa (right) as compared with Grimm alfalfa (left). (Courtesy Iowa Agricultural Experiment Station.)

#### COSSACK

Cossack alfalfa was introduced into this country from Russia in 1907 through the efforts of the United States Department of Agriculture. It is an earlier generation hybrid between the common and yellow-flowered alfalfa than Grimm, and for this reason the flowers show a higher percentage of variegation, the yellow and white flowers being more abundant. In certain tests Cossack has yielded somewhat more than Grimm and other variegated alfalfas, but on the whole it has not shown evidence of being appreciably superior for most conditions. It is adapted for growing under practically the same conditions as Grimm.

**CANADIAN VARIEGATED**

Canadian Variegated, or Ontario Variegated, is the name given to an alfalfa of hybrid origin grown in eastern Canada for many years. It is very similar to the Grimm variety in flower color and in general habit of growth. In fact, these two varieties are so much alike that it is seldom possible to distinguish one from the other. Canadian Variegated also compares very favorably with Grimm in yield of seed and hay, but, like it, usually yields less than common alfalfa where the latter survives the winter without injury. It has proved more cold-resistant than common alfalfa and is adapted to about the same general region as Grimm. In New England and other States of approximately the same latitude, its superior hardiness as compared with ordinary alfalfa has been pretty well demonstrated. In tests conducted in the northern Great Plains it has not usually survived the winters quite so well as Grimm. Differences in adaptation of strains of Canadian Variegated have been observed.

Under the Federal Seed Act amendment, 1 percent of the seed must be stained violet before it is permitted entry.

**LADAK**

In 1910 a small quantity of alfalfa seed was obtained from Ladak, northern India, through the efforts of the United States Department of Agriculture, and a little later several other small packets were obtained from the same source. This variety appeared very promising in the preliminary tests in the northern Great Plains, where it suffered less winter injury and generally was more productive than most others. When it seemed likely to become of commercial importance the name Ladak was assigned to it.

No other alfalfa grown commercially in the United States shows such a wide variation in growth habits of individual plants, some being very desirable and others undesirable, thus offering an excellent source of material for selection. Plants obtained from the original seedings were predominantly yellow-flowered, but hybridization in subsequent generations has resulted in a gradual increase in the proportion of purple flowers. The variety, however, still shows more variegation, with a greater percentage of yellow flowers than any other alfalfa in the group.

In the region where Ladak is adapted one of its outstanding characteristics is its ability to make an exceptionally heavy first crop. As it excels all other varieties in this respect, it is especially valuable where only one good cutting is normally obtained. It recovers slowly after being cut, and as a result the second and third crops of other varieties often exceed in yield those obtained from Ladak. Because of the heavy first cutting, however, the total seasonal yield of Ladak is often in excess of that of other varieties.

Like Turkistan, Ladak has a tendency to become dormant early in the fall. Being relatively free from leaf diseases, it retains its leaves remarkably well, and thus yields a high quality of hay. It has also shown considerable resistance to bacterial wilt, though it is not equal in this respect to the alfalfas of the Turkistan group.

In many tests Ladak has proved superior to all others for the cold and dry conditions found in the northern Great Plains, and it has

also given good results under irrigation in the Northwest. Even as far south as Manhattan, Kans., yields obtained from Ladak have compared very favorably with those from other alfalfas. Where wilt is prevalent in this general region, Ladak has considerable advantage over other variegated and common varieties. East of the Mississippi River, it has given variable results. It has stood at or near the top in yield in a few tests conducted as far east as Ohio. Farther east Ladak, like Turkistan, has not appeared promising, owing apparently in part to its slow recovery after being cut and to its tendency to become dormant early in fall, giving an opportunity for weeds to invade a field and thus gradually crowd it out. It is not suited to the southern half of the United States.

There is at present a considerable acreage of Ladak alfalfa, principally in Montana and Oregon.

#### BALTIC

There is no authentic record of the introduction of Baltic alfalfa into this country, although there is no doubt that the original stock came from Europe. The name Baltic was first applied to it in 1906, for the reason that it had been grown for about 10 years near Baltic, S. Dak., and not, as has been supposed, in the Baltic Sea region of Europe.

This alfalfa differs slightly from Grimm in some minor details, but the two are so similar that it is seldom possible to distinguish one from the other, and the description as given for Grimm applies equally well to Baltic. In some tests Baltic has slightly exceeded Grimm and in others the reverse has been true, but in general the two varieties may be considered of about equal value.

Baltic alfalfa has unquestionably been developed in much the same way as Grimm and therefore owes its hardiness to the same causes—the presence of the yellow-flowered alfalfa in its ancestry and natural elimination of the less hardy plants as a result of having been grown under severe climatic conditions.

This variety is best suited for sections where the ordinary alfalfas suffer considerable winterkilling. These sections include practically the same territory as that to which Grimm is best adapted. Meeker Baltic is a strain of Baltic alfalfa grown in Colorado.

#### HARDIGAN

Hardigan alfalfa is a selection from Baltic made at the Michigan State Agricultural College for its high seed production and as a desirable forage type. In general growth habits it is similar to Grimm and other variegated alfalfas. The flowers, however, are largely purple, very little variegation being in evidence. Hardigan blossoms more freely and, where conditions are conducive to seed setting, produces larger yields of seed than almost any other alfalfa. In many parts of the East, however, it has not produced profitable yields of seed in most seasons, indicating that the problem of seed production under humid conditions cannot be solved by its use. In cold resistance and productivity it is similar to Grimm and Baltic and is, therefore, adapted to about the same region as other variegated al-

falfas, namely, the Northern States, where winterkilling is likely to be serious.

#### **SAND LUCERN**

Sand lucern, a member of the variegated group, is no longer grown commercially as such in the United States. Numerous lots of seed have been tested in the past, and considerable variation has been noted in cold resistance and growth habits. It is believed that the Grimm, Baltic, and Canadian Variegated alfalfas are the result of natural selection from the Sand lucern of Europe.

#### **NONHARDY GROUP**

Certain alfalfas distinct from the regional strains of common alfalfa have been developed in the southern part of this country. These are especially characterized by long periods of growth, by ability to make better growth under short days than the hardier northern strains, and by quick recovery after being cut. Because they are so much more seriously affected by low temperatures than the other commercial varieties or strains, for lack of a better group designation they have been classed as nonhardy alfalfas. Included in the group are such alfalfas as Peruvian, Arabian, and India, though only the Peruvian has attained any degree of commercial importance in the United States. All nonhardy alfalfas tested for wilt resistance have proved highly susceptible.

#### **PERUVIAN**

Peruvian alfalfa was first introduced into the United States in 1899 through the efforts of the United States Department of Agriculture. Two distinct types have been noted in alfalfas from Peru, differing in several respects but most noticeably in the abundance of hairs on the leaves and stems. These two alfalfas are distinguished by the names "smooth Peruvian" and "hairy Peruvian." At one time there was a considerable acreage of smooth Peruvian in Arizona, but it has gradually decreased in importance. At present only the hairy Peruvian is receiving much attention, and even it seems to be gradually declining in popularity.

As compared with common alfalfa, the Peruvians are more upright, less branched, and have fewer and somewhat coarser stems, though in thick stands this difference is not marked. The most striking characteristic of hairy Peruvian is the pubescence or hairs on the whole plant, giving the foliage a grayish appearance.

The Peruvian alfalfas are characterized by rapid growth, quick recovery after being cut, and in sections having a mild climate by their ability to grow in cold weather and short days after the growth of ordinary alfalfa has ceased. Under such conditions they begin growth earlier in spring and continue to grow later in fall than most other commercial varieties, thus lengthening the growing period and therefore giving more cuttings during the season. Hairy Peruvian exhibits this characteristic to a somewhat greater degree than smooth Peruvian.

Lack of hardiness will always confine Peruvian alfalfa to the southern and southwestern parts of the United States, where the winter temperatures are comparatively mild (fig. 4). It cannot be grown to advantage where the temperature falls below 10° F., and efforts to extend its culture into the Central and Northern States are unwarranted and are sure to result disadvantageously. Peruvian alfalfa is not drought-resistant and therefore is not to be recommended for dry-farming sections.

#### ARABIAN

Arabian alfalfa was introduced into the United States in 1902 and first attracted attention because of its rapid growth. It has a tendency to be short-lived but because of its rapid growth might be of

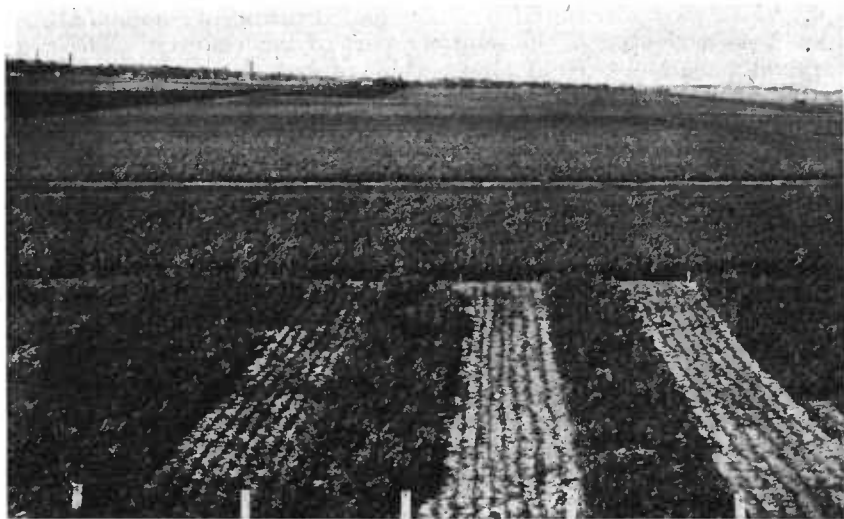


FIGURE 4.—Alfalfas vary in their resistance to cold. The three plots of good growth, left to right, are Provence, Russian, and Nebraska-grown Common; the other three (lighter shades) are one plot of Italian and two of Peruvian. Southern or nonhardy alfalfas are often killed completely the first winter when sown in the Northern States, thus resulting in serious losses to the farmers. (Courtesy Nebraska Agricultural Experiment Station.)

value in short rotations. At present, however, there is no known source from which seed can be obtained in commercial quantities.

#### YELLOW-FLOWERED GROUP

The yellow-flowered alfalfas are of no commercial importance since very little seed is available, but, being very cold-resistant, they are of interest for hybridizing with purple-flowered alfalfa in an effort to produce a hardier variety. They exhibit a wide range in growth habits, some being prostrate and others upright. Even the upright types ordinarily produce only one satisfactory cutting, and the yields are therefore relatively low. Furthermore, seed is produced in small

quantities and shatters badly. At one time there was considerable interest in two yellow-flowered alfalfas, Orenberg and Semipalatinsk, but no seed is commercially available at present.

## NEW VARIETIES

### RANGER

Ranger alfalfa (known as A-136 in the Alfalfa Conference testing program) is a synthetic variety produced through the cooperative efforts of the Nebraska Agricultural Experiment Station and the Division of Forage Crops and Diseases of the United States Department of Agriculture. It has been widely tested under the auspices of the Alfalfa Improvement Conference, and in addition some of the members of the International Crop Improvement Association have materially assisted in the production of foundation seed. Thus it has been possible through the cooperation of these agencies to determine rather carefully the adaptation of this variety and, at the same time, to increase the seed supply. In this way the length of time required from final selection to commercial distribution has been very greatly reduced. Several States now have it under production.

Ranger may be called a multiple-strain variety, having been synthesized from selections originating from the varieties Cossack, constituting 45 percent; Turkistan, 45 percent; and Ladak, 10 percent. During the past year the second synthetic generation has been tested for forage productivity, and no significant difference in yield was obtained between the first and second synthetic generations. Some of the original strains of Turkistan entering Ranger were brought direct from that country by H. L. Westover, an explorer for the United States Department of Agriculture.

In morphological characters Ranger exhibits considerable variability, both in habit of growth and flower color, being distinctly variegated in the latter. Occasionally yellow-flowered plants are found. It would be classified, therefore, in the variegated group. The plants vary in habit of growth from decumbent to upright. The variety has greater rapidity of recovery after cutting than Ladak or Cossack, being about the same as Grimm in this respect. It is slightly more susceptible to leaf-spot diseases and leafhopper yellowing than Grimm, but not so susceptible as Hardistan or the Turkistans in this respect. These latter characteristics should not prove a handicap under conditions west of the Mississippi River, but may be somewhat detrimental for eastern areas. Where bacterial wilt is a serious factor, however, its resistance to this disease will more than offset its susceptibility to leaf diseases.

Ranger is distinctly superior in seed production to Hardistan or the Turkistans, being about equal to Grimm. In forage production it is intermediate between Grimm and Hardistan when all have equally good stands. It is about equal to Grimm in cold resistance. The outstanding characteristic of Ranger alfalfa is its resistance to the bacterial wilt disease; it is greatly superior to all domestic strains and equal or superior to the Turkistans, including Hardistan and Orestan. It may be found useful where bacterial wilt is a serious factor in the northern part of the United States.



## BUFFALO

Buffalo alfalfa was produced at the Kansas Agricultural Experiment Station in cooperation with the Federal Bureau of Plant Industry, Soils, and Agricultural Engineering. It is a selection from an old line of Kansas Common alfalfa traceable back as far as 1907 as a Kansas-grown strain. It was tested as A-11 in the first uniform nurseries. During the process of selection over a period of several years this strain, while not inbred, was close-bred, particular attention being given to such characters as bacterial wilt resistance and seed and forage productivity, and at the same time the desirable characteristics of the original Kansas Common strain were kept in mind. Buffalo alfalfa



FIGURE 5.—Wilt resistance of alfalfa strains: Left, Buffalo; right, Baltic. These are 3-year-old stands. (Courtesy Ohio Agricultural Experiment Station.)

has a bluish-purple flower, ranging from a light blue to a reddish purple. It is a variety belonging to the common alfalfa group.

In extensive tests, Buffalo is showing superior performance. It compares favorably with Kansas Common in yield and other characteristics and is superior to Kansas Common in being resistant to the bacterial wilt disease (fig. 5). Buffalo alfalfa is well suited for growing where Kansas Common is adapted. This is generally recognized as the central and southeastern parts of the United States, including the range across the country at approximately the same latitude as Kansas and areas southeast of that State. Because of the more rapid recovery of Buffalo after cutting and its larger fall growth, it can be used more extensively than Kansas Common has been in this part of the country.

In experimental tests Buffalo has had a higher stand survival than Kansas Common in the northern alfalfa areas of the United States.

For this reason its range of adaptation probably will include areas somewhat north of the northern Kansas latitude. Just how far north Buffalo may be expected to survive the winter is being determined by further cooperative tests.

Not much seed is commercially available at present, but it is being rapidly increased.

#### ATLANTIC

Atlantic alfalfa is a vigorous, high-yielding variety, adapted to areas in the Eastern States where bacterial wilt is not a serious factor. It was developed at the New Jersey Agricultural Experiment Station as a result of selection within the following parent varieties: Hairy Peruvian, Grimm Saskatchewan 451, Cossack, Hardigan, Lebeau, Canadian Variegated, Grimm, Montana Common, Kansas Common, Ladak, and Highland Utah.

In many characteristics Atlantic is similar to Hardigan or Baltic and should be considered as a variety of the variegated group. It is not resistant to the bacterial wilt disease, although slightly more tolerant than Grimm or Hardigan. Seed of this variety is being increased as rapidly as possible.

#### NEMASTAN

Named Nemastan by the United States Department of Agriculture, in cooperation with the Nevada and Utah Agricultural Experiment Stations, this variety is an original introduction made by H. L. Westover from the Askhabad district of Turkistan. It has been tested under Forage Crops No. 19304.

In tests in Utah and Nevada, Nemastan has been outstanding in survival where the soil is infested with the stem nematode (*Ditylenchus dipsaci*). This nematode is so severe in certain sections of these two States that alfalfa growing was becoming very hazardous or even impossible. It was therefore decided to increase this strain for use in infested areas in the two States, and it was named in December 1943.

Nemastan has another advantage in being somewhat resistant to bacterial wilt. The variety has been tested under F. C. No. 19304 in several Central and Eastern States, and it was found to be extremely susceptible to leaf spot and often was low yielding. It is therefore not recommended except in the Western States. There has been no selection within the original introduction and it should therefore be considered a member of the Turkistan group.

Nemastan is considered quite useful as a stopgap for these specified conditions until something better can be produced through selection and breeding. The seed supply is being increased as rapidly as possible.

#### VARIETIES FOR VARIOUS SECTIONS

In many parts of the United States tests have been going on for some years with alfalfas from various sources, the objective being to determine the variety or strain that can be most profitably grown in a specific locality or under certain conditions. As a result of these tests it is now possible to designate with considerable definiteness

the part of the country where each of the various commercial strains or varieties may be expected to give the most satisfactory results.

The common alfalfas vary considerably in hardiness, depending mainly upon the conditions under which a particular strain has developed. Their range of adaptation covers much of the United States, the northern and more cold-resistant strains being best suited for growing in the Northern States and the southern nonhardy strains for the Southern States. In general, common alfalfa may be expected to give fairly satisfactory results in the latitude in which the seed has been grown for several seed generations. Even the hardiest strains of common alfalfa are not dependable where the winters are particularly severe. The hardier variegated alfalfas are much to be preferred under such conditions.

The Grimm, Cossack, Baltic, Canadian Variegated, and Hardigan varieties are more cold-resistant than any of the common alfalfas and may be used to advantage from about the fortieth parallel northward and at higher altitudes farther south. There are many areas within this region where soil and climatic conditions are particularly favorable to the growth of alfalfa and where some of the common alfalfas may be used to advantage, especially in short rotations, the seed being somewhat cheaper. Even under these more favorable conditions, however, the variegated alfalfas have generally been somewhat more productive in the northern half of the United States and have usually been inferior to the common alfalfas in the South.

Ladak alfalfa is adapted to the part of the country lying west of the Mississippi River and from Kansas northward, being especially valuable for the cold, dry conditions in the northern Great Plains. In limited tests Ladak has succeeded fairly well in the Northern States as far east as Ohio, but from this point eastward it has not compared very favorably with other variegated alfalfas. It is not adapted to the southern half of the United States.

Turkistan, Hardistan, and Orestan alfalfas are recommended for wilt-infested soils west of the Mississippi River and from Kansas northward. They have not generally given good results in the Eastern or Southern States.

Peruvian alfalfa, like strains of common alfalfa grown in the Southwest, can be used to advantage only where the winters are mild. The section to which this alfalfa is adapted includes the greater part of California, except the mountainous areas, southern Arizona, southern New Mexico, southern Texas, and the coastal region of the South Atlantic and Gulf States.

The range of adaptation of the new varieties is indicated under the description of each.

### SAFEGUARDS IN PURCHASING SEED

At one time, farmers had difficulty in obtaining seed of the kind of alfalfa desired, owing to misrepresentation, intentional or otherwise, and serious losses were incurred from sowing unadapted seed. This situation, however, has been largely remedied, and by observing the registration and certification labeling found on certified seed, the United States Verification Service labeling, and the seed-staining reg-

ulations as applied to imported seed, the purchaser may be reasonably sure of the variety and origin of the seed.

Many States certify seed as to variety, each package bearing a certifying tag. Varieties so registered or certified include Grimm, Cosack, Baltic, Ladak, Hardigan, Orestan, Hardistan, Ranger, Buffalo, Atlantic, and, in some States, seed from fields of common alfalfa of long standing. Methods of procedure and regulations have been developed by State certifying agencies under which seed of alfalfa varieties can be increased without becoming contaminated by strains having inferior characteristics.

The need for seed certification of superior alfalfas is emphasized by the recent finding of the high percentage of cross-pollination effected by bees and by the fact that when a bacterial wilt-resistant strain and a susceptible strain are grown side by side in the field the seed from the resistant strain is about half as resistant as before. Certified seed assures trueness to variety.

The United States Verification Service verifies the origin or place where the seed was grown, without regard to the variety, quality, purity, or germination. Each package of such seed bears the United States Verification tag.

The Federal Seed Act <sup>4</sup> of August 9, 1939, requires that alfalfa seed from foreign countries be stained before it is permitted entry into the United States. In accordance with this act and rules and regulations thereunder, 10 percent of the seed from any country other than South America or Canada must be stained red. Alfalfa seed from any of the countries of South America must be stained 10 percent orange-red, and seed from Canada 1 percent violet.

In some cases seed represented to be Grimm alfalfa is offered as "Affidavit Grimm." Tests conducted by the United States Department of Agriculture indicate that such seed cannot always be relied upon as being true to name, since some of the lots have been found to consist largely or in part of common alfalfa.

<sup>4</sup>For the text of the act, with rules and regulations, see Service and Regulatory Announcement No. 156. This announcement with amendments to the regulations may be obtained from the Office of Marketing Services, U. S. Department of Agriculture, Washington 25, D. C.

